November 26, 2001

MEMORANDUM FOR: Roy Anderson
Project Development Branch

FROM: Charles W. Challstrom
Director, National Geodetic Survey

SUBJECT: INSTRUCTIONS: Marksetting, GPS Observations and Leveling in Support of the BARREN ISLAND MARSH RESTORATION (GPS-1636)
Task Number: 8K3B7300

GENERAL:

The National Geodetic Survey (NGS), in cooperation with the National Ocean Survey's (NOS) Center for Operational Oceanographic Products and Services (CO-OPS) and Office of Response and Restoration (ORR), will establish control stations in the Barren Island Marsh Area in Chesapeake Bay, Maryland. These stations will be tied to the local Federal Base Network/ Cooperative Base Network (FBN/CBN) through GPS observations.

PURPOSE

CO-OPS and NGS have agreed to support ORR with a marsh restoration project at Barren Island. From the water level/ tidal datums aspect, there are three main goals of the project: 1)establish local tidal datum elevations for the marsh site using available historical information and the closest operating National Water Level Observation Network (NWLON) station; 2)estimate the long-term sea level trends and variations at the marsh site using the closest long-term NWLON station; and 3)analyze the frequency of high waters relative to the present marsh surface and the duration that the marsh surface is inundated due to the elevations of high waters.

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The role of NGS is: 1)to transfer the water level datum information to the project area, and 2)to establish geodetic control in the area to use during the construction phases of the restoration project.

GPS SPECIFICATIONS:

Five bench marks are to be set on the island evenly distributed across the restoration area. Ties will be to CBN SHA 1001, a new HARN point. Station occupation and observing procedures shall be carried out in accordance with the "NGS Operations Handbook" and appropriate equipment user manuals.

Data formats and digital file definitions are given in "Input Formats and Specifications of the National Geodetic Survey Data Base," Volume I, Horizontal Control Data, Federal Geodetic Control Subcommittee, September 1994. Success in meeting the accuracy standards will be based on repeatability of measurements, adjustment residuals, and analysis of loop misclosures.

General specifications for the project are given in "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques," Version 5.0: dated May 11, 1988, reprinted with corrections August 1, 1989.

Specific to this project is that at the site, three sessions of 2 hours each shall be observed at each station. In order to provide a check, the equipment shall be broken down and reset with a minimum of 30 minutes between the two sessions.

GPS DATA ACQUISITION:

Data collection shall be accomplished at 15-second epoch intervals referred to the minute. The Trimble 4000 series receivers must collect data in the compressed mode as specified in the Trimble users manual. Track satellites down to a 10-degree elevation angle.

Record weather data at the beginning and end of the session. Meteorological data shall also be collected immediately after an obvious weather front passes during the session and immediately before it passes, if possible. Atmospheric

pressure and relative humidity measurements must be made at approximately the same height as the GPS antenna phase center. Record on the observing log the time and place that the weather data were gathered.

Antenna set-up is critical to the success of this project. Fixed-height tripods are preferred for all receivers. The plumbing bubbles on the antenna pole of the fixed-height tripod must be shaded when plumbing is performed. Plumbing bubbles must be shaded for 3 minutes before checking and/or re-plumbing. The perpendicularity of the poles must be checked at the beginning of the project and any other time there is suspicion of a problem.

When a fixed-height tripod is not used, the height of the antenna must be carefully measured to prevent station set-up blunders. Tribrachs used for these set-ups must be checked and adjusted when necessary. Totally independent measurements of the antenna height above the mark in both metric units and English units must be made before and after each session. Someone other than the observer must check the measurement computations by carefully comparing measurements and then entering his/her initials on the log.

A legible rubbing of the marks must be made at the time of the first occupation of a station. When not feasible to make the required rubbing, a plan sketch of the mark must be substituted, accurately recording all markings. In addition, a layout sketch of the facility should be made. Include the location of the marks, antennae, buildings, and any other identifying characteristics of the area on the sketch. Take photographs of the site layout, reference stations, and any unusual situations.

The success of this project requires that the highest quality GPS data be collected. Therefore, during each station occupation, the operators shall carefully monitor the operation of the receivers. Any irregularities in the data due to equipment malfunction, DOD adjustment of the satellite orbit, obstructions, etc., must be reported to N/NGS21 as soon as possible. If the quality of observations for an observing session is questionable, notify N/NGS21.

VECTOR COMPUTATIONS:

Data management, quality review, and final vector processing will be accomplished using PAGES. Vectors will be computed in the IERS Terrestrial Reference Frame (ITRF) using the most current epoch and precise ephemerides. Use 30-second epoch interval for processing. Use 15 degrees as the cutoff angle in data processing. A cutoff angle of 10 degrees may be used when necessary to improve results.

The type of final solution, L1 versus ion-free, will depend on the length of the vectors. For vectors from the antenna to the other stations at the site that are less than 5 km in length, the final reduction will consist of an L1 fixed solution. For the local FBN/CBN tie, there will be vectors computed from the antenna to the ties which are greater than 5 km in length. These vectors will be computed in a separate processing session from the short (less than 5 km) vectors.

In general, vectors greater than 10 km in length are to be computed in an ion-free fixed, or partially-fixed, solution. In all cases, integer ambiguities will be fixed for each vector whenever possible.

The quality of collected data shall be determined from the plots generated from PAGES and by analysis of repeated vectors and/or comparison of station positions, and free adjustment residuals and/or loop misclosures.

Richard H. Foote, GPS Branch, will perform all quality checks for conformance with NGS format standards such as executing software programs COMPGB, OBSCHK, and OBSDES. The final ITRF vectors will be assessed and transformed to the NAD 83 coordinate system using program ADJUST. The computed NAD 83 positions will be compared to the published NAD 83 positions, if available.

The data and results will be submitted to the Observation and Analysis Division. All B-files and G-files must be complete, including *25* and *27* records.

GPS DATA:

Observing windows shall be selected and modified as necessary, to maximize satellite visibility for each session.

The project report and GPS data listed in Appendix L, Volume I, of "Input Formats and Specifications of the NGS Data Base" must be transmitted to the Project Development Branch. Any data considered suspect as to quality in achieving accuracy standards should be sent in immediately for office review. Backups of transmitted data must be held until notified by the Project Development Branch.

For the BARREN ISLAND project, the data set collected shall be named “mdlv100d.907". All records in connection with the project shall be titled “BARREN ISLAND MARSH RESTORATION PROJECT, 2001". The project number is GPS-1636.

LEVELING DATA FORMATS AND HANDLING:

A. Leveling data will be submitted in "Blue Book" format (see "Input Formats and Specifications of the National Geodetic Survey Data Base," Volume I. Horizontal Control Data (revised November 1998) and Volume II. Vertical Control Data, Federal Geodetic Control Subcommittee, September 1994) to NGS Headquarters on floppy disks. Floppy disks shall contain the final version of the following files: HGF, HGZ, and HA in direct access format and RPT and ABS in sequential format. Data shall be submitted to the Field Operations Branch within 30 days of completion of the project.

B. All bench marks established during this leveling project must be plotted on the best available map and the positions scaled using standard procedures, if the bench mark position cannot be determined with a GPS instrument. One set of these maps shall be submitted with the data. Those recovered bench marks which do not have PIDs will be treated as new marks.

C. Recovery bench mark descriptions shall be written in accordance with the "Blue Book" (unified descriptions), except do not submit incomplete descriptions (i.e., descriptions with Recovery Type Codes of "RM"), unless the bench mark is destroyed or not recovered.

STATION DESCRIPTIONS:

Station recovery notes must be submitted in computer-readable form using WDDPROC software. Include the name, address, and telephone number of property owners or other contacts.

LIAISON:

The street address of the following NGS office in Building SSMC3 is:

1315 East-West Highway
Silver Spring, MD 20910-3282

Questions concerning the leveling portion of the project shall be directed to:

Roy W. Anderson
Project Development Branch
Spatial Reference System Division
SSMC3 -- N/NGS2, Station 8709
Telephone: 301-713-3194, ext. 110
Fax: 301-713-4316
E-Mail: Roy.Anderson@noaa.gov

The NGS State Advisor for Maryland is:

Don Mulcare
MD State Highway Administration
Plats and Surveys Division
Mail Stop M-101
707 North Calvert Street
Baltimore, MD 21202
Telephone: 410-545-8963
Fax: 410-209-5022
E-mail: Donald.Mulcare@noaa.gov

ADDRESS:

Keep the Project Development Branch informed of the party's physical address and telephone number at all times.

PUBLICITY:

See "NGS Operations Handbook," Section 1.4.1.

EXPENSES:

Expenses for this project will be charged to Task Number 8K3B7300.

TRAVEL:

Travel and per diem are authorized in accordance with Federal Travel Regulations, Part 301-11, Per Diem Allowances. Current per diem rates were effective October 1, 2001.

ACKNOWLEDGMENT:

Please acknowledge receipt of these instructions in your Monthly Report.

Attachments

cc: N/NGS - D. Zilkoski
N/NGS - S. Misenheimer (first page only)
N/NGS - D. Milbert
N/NGS1 - G. Mitchell (first page only)
N/NGS11 - S. Cofer
N/NGS1x1 - D. Mulcare
N/NGS2 - E. McKay
N/NGS21 - S. Frakes
N/NGS21 - C. Craig (first page only)
N/NGS21 - D. Hendrickson
N/NGS22 - R. Foote
N/NGS4 - E. Wade
N/NGS42 - D. Crockett
FGCS Members (first page only)

Attachment 1

BARREN ISLAND MARSH RESTORATION

LEVELING CONNECTIONS:

Five bench marks are to be set on the island. They will be tied to CBN SHA 1001. Total distance (progress) to be leveled is approximately 2 km.

All High Accuracy Reference Network (HARN) control points within 1 km of the leveling route and all other existing NSRS horizontal control within 1 km of the leveling route will be connected to this project.

LEVELING SPECIFICATIONS:

The line shall be leveled in both directions to second-order, class I standards. Leveling in one direction is acceptable when leveling between old bench marks, provided the newly observed elevation difference agrees with the previous difference within tolerance limits. When new marks are set, or the newly observed elevation difference between two old marks does not agree with the previous difference within tolerance, one side of the new or moving mark must be leveled in both directions.

In addition, if multiple new marks are set between old marks, all but one section between the old marks are to be leveled in both directions. Specifications and other technical considerations for this project are given in the "NGS Operations Handbook," "Geodetic Leveling Manual," "Bench Mark Manual," and "Interim FGCS Specifications and Procedures to Incorporate Electronic Digital/Bar-Code Leveling Systems."

LEVELING PROJECT TITLE, HGZ NUMBER, AND JOB CODE:

A. The leveling project title, HGZ number, and job code shall be named, respectively:

BARREN ISLAND MARSH RESTORATION PROJECT, CHESAPEAKE BAY, MARYLAND
L26282
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